

CHAPTER 5

Timed Eggs and the Elusive Percussion Grenade 1916–18

In some ways, the popularity of the Mills grenade turned out to be a bit of a millstone. Although its shortcomings were eventually resolved, the Trench Warfare Department wanted to provide the Army with a safer grenade that had none of the defects of the Mills. Unfortunately, this was no easy matter as there was considerable resistance to change. As far as most bombing officers were concerned, the Mills worked perfectly well and some even turned one of its recognized defects into a desirable quality by suggesting that all future grenades should have a lever that needed to be firmly gripped against the casing after the pin had been pulled. Its popularity, together with the dislocation to supplies that would inevitably ensue if it were to be replaced, along with the difficulties of introducing a new training programme for a new grenade, all proved to be strong arguments against change. Indeed, no subsequent service pattern of grenade supplanted the Mills as the principal type.

The only other time-fused grenade to be used in any numbers was the No. 34 Egg grenade, which appeared at the Front in the spring of 1917. It was designed in France in response to a recognized need for a lighter hand grenade that could be thrown further than the Mills. The Germans had introduced the *Eierhandgranate*, a light egg grenade, and with it were out-throwing the British bombers armed with the Mills. While on the Somme in 1916, Charles Carrington experienced at first hand one of the new German *Eierhandgranate*. 'Suddenly I saw lying in the middle of the trench a small black object, about the shape and size of a large duck's egg. There was a red band round it and a tube fixed in one end of it.' The tube was the striker assembly. Although he had never seen one before he realized immediately that it was a grenade, but he was trapped in a corner of the trench with the object no more than 3 ft away. It exploded, but apart from a minor wound, shock and being showered in dirt, he was unharmed. Carrington believed that this was the first recorded use of the *Eierhandgranate*.

Although the *Eierhandgranate* was supposed to be highly effective for trench work, Carrington's experience suggested otherwise. Sassoon's experience of the German egg grenade in April 1917 also suggested that it was ineffective. It was a blast grenade and produced very little shrapnel. In theory, blast in the confines of a trench should have been highly destructive to human beings but clearly there were circumstances under which it was not.

The British egg grenade, on the other hand, was a fragmentation bomb like the Mills. It may have been another of the designs to come out of the Second Army Workshop, although Newton was no longer there in 1917 having moved to the Trench Warfare Department as an assistant director in 1916. It was, at any rate, an Army invention designed in France and did not come out of any of the weapons inventions departments in the UK, although the Trench Warfare Department was involved in testing it. Samples of the new grenade were made in France and supplied to front-line units for trials. These went well and in the spring of 1917 GHQ asked for 500 of the grenades to be manufactured in Britain so that further trials could be conducted. GHQ wanted the trials to be comparative and asked that similar numbers of any like grenade should also be supplied.

Two types were eventually supplied for trial, one in the GHQ design which had 'an internal spring wire in a groove' to retain the striker, the other having a shear wire to retain it. The trials showed that the latter design was preferable but the shape and weight were not ideal. In 'Notes on Inventions and New Stores No. 1' (SS171) covering the months April, May and June 1917, another similar pattern of grenade was mentioned in relation to these although it is not clear what this was. It had recently been brought to France and had a shape that was better suited to throwing and weighed less than 10 oz whereas the GHQ pattern weighed 12.5-13 oz. GHQ wanted a supply of these for troop trials. The shear-wire pattern had a 5.5-second fuse and weighed 10-11 oz. These were all referred to as egg grenades and all were fragmentation types. Weight for weight, the shear-wire pattern produced 30 per cent more fragments than the Mills. This pattern had to be struck against a hard surface to break the wire and initiate the fuse. In practice, this was the side of a boot. The striker on all of them protruded from a short cylinder on the top of the grenade.

By midsummer 1917 trials with the egg grenades were well under way in England. These indicated that there was a danger of prematures caused by flash through but subsequent trials with 1,170 grenades fitted with a 5-second fuse revealed no such problem. In fact, the fuses were remarkably consistent in the length of time they took to burn, 97.5 per cent burning for at least 5 seconds and none burning for longer than 6 seconds. The shortest fuse was within half a second of the ideal. This was a far cry from the fuse problems a year or two earlier when some of them were so short as to be for all practical purposes instantaneous and deadly to the unfortunate thrower. Because of the success of the trials of the egg grenade, GHQ asked for 150,000 to be shipped out to France 'with a subsequent weekly supply of 25,000 a week'. Curiously, GHQ added a request that 'the first supplies might be fitted with 7-second igniter sets until the troops have become accustomed to handling these grenades'. Presumably GHQ believed that if the soldiers had to strike a hard surface to initiate the fuse before throwing the grenade they would either forget to strike it or hang on to it for too long afterwards.

At some point in the trial process the egg grenade became the No. 34 and the various types under trial were given mark numbers. The Mk I was the original GHQ design with the internal spring. The Mk II was the shear-wire model with a 7-second fuse while the Mk III had a more ovoid shape; Mk I and II had more bulbous bodies with narrowed necks so that they resembled pears with flattened sides. In addition, the location of the filling hole was different on the Mk I, being in one side of the curved base of the body, while on the other marks the filling holes were in the side. They were all just under 4 inches in length and fitted very neatly into the hand.

There was also a Mk IV version. This was essentially the same as the Mk III except that it had a ring cast round the middle of the ovoid at its greatest diameter. The purpose of this was to allow the grenade to be fired from a cup discharger without the need for a gas-check disc which had to be fitted to the Mills in order to fire it from a cup discharger. It made no difference to its effectiveness or use as a hand grenade. When this modification was proposed to the Army Council in the autumn of 1917, it was not keen to adopt the alteration to the shape. The manufacture of the Mk III was well advanced and any alteration to the design would 'entirely dislocate the current supply and is therefore very undesirable'. However, it was persuaded by the arguments of Major-General Richard Butler, one of Haig's staff. He pointed out any such change in the design should not be made immediately but gradually introduced 'as opportunity occurred' so that supply would not be disrupted. There were other arguments related to the inevitable necessity of adopting another cup discharger to fire the grenades as rifle grenades if the modification to the design was adopted. The question came

down to resources both in terms of skilled labour and in terms of materials. Butler made it clear that in the balance of pros and cons, the pros won hands down. As these relate to rifle grenades rather than hand grenades this is dealt with more fully in Chapter 7.

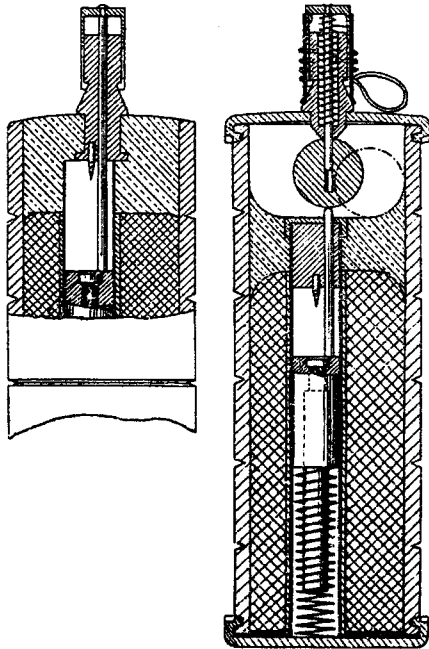
Despite the effectiveness of the egg grenade in trench work, it never ousted the Mills as the main hand grenade in British service. The egg could be thrown further and because it was lighter more could be carried by one man than the Mills. It was also safer than the Mills; there was no rash of accidents as soon as it was given to troops. It was better designed in some respects, certainly simpler, having no lever and striker arrangement. The fuse was straight, not curved into a letter J, and the fuse burned for the stipulated time. The Mills made a big bang and was dangerous to anyone within a distance of more than 60 yd because the big fragments and the base plug had the momentum to travel a very long way and still cause fatal injuries.

In some ways the egg had more similarities with the expedient grenades of 1915 than it did with the Mills. Although greater experience meant that it was a better design by far than grenades like the Pitcher and the Lemon, nevertheless, it was still an underdeveloped munition as witnessed by the changes in its design that occurred in quick succession. The Mills was no more perfect than the egg but it was developed over a longer period into a very effective munition. And it filled a desperate need when there was nothing else comparable. Moreover, the Mills was an independent design that was not created as a response to the German grenade threat, whereas the egg was. Perhaps if the egg had come in 1915, it might have taken the place that the Mills assumed but it came too late to make much of a dent in the Mills's reputation and position.

The Mills effectively stifled all other grenade development. There was no incentive to change and, in fact, the converse was true. This was a major obstacle to the development of an effective and safe percussion grenade. Although 1915 saw the percussion grenade supplanted by its time-fused cousin, the desire for a percussion grenade never went away. The Trench Warfare Department was especially keen, its enthusiasm for the percussion grenade never diminishing. It put a lot of time and effort into searching for the ideal one. Such a grenade had to be safe and foolproof yet at the same time sensitive, a conflicting set of criteria that made the task far from easy. On top of that, it also had to be waterproof. Bitter experience had shown the havoc that bad weather could cause with grenades that were not waterproof. And if that were not enough, any new grenade was expected to be suitable for both throwing by hand and rifle launching (by late 1917, this meant capable of being fired from a cup discharger).

Lieutenant-Colonel Brothers claimed in 1919 that 'the advantages of a Percussion Grenade over the Time Fuze type have always been realised'. Whether percussion grenades were better than time-fused grenades was debatable. As a hand grenade, the percussion type has never been popular or common. The advantage of the time-fused variety is that the fuse itself forms part of the safety system, whereas the percussion fuse is inherently dangerous. The Trench Warfare Department wanted a percussion grenade that was actually safer than time-fused grenades, a rather lofty and unattainable goal. Brothers conceded that until this was in sight it would be ill-advised to 'disturb the position of the Mills'. He had to admit that the department had not succeeded in providing a suitable percussion grenade because the trials were 'more severe and searching than have been applied hitherto to any type of Grenade accepted for the Service' and nothing had been passed. It is not inconceivable that had the Mills been subjected to these tests it would have failed.

Nevertheless, in the context of the trenches and shell-pocked landscape of the battlefields of the First World War the percussion grenade did possess certain advantages



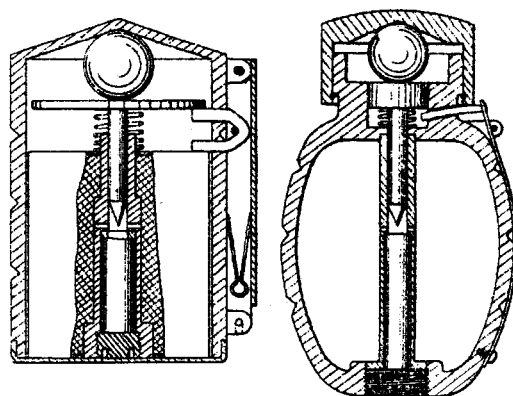
Percussion hand grenade invented by H. Siegart and illustrated in UK patent 102,332. It includes a safety device to prevent accidental detonation. The firing pin is held away from the cap by a rod and ball which are released by pressing down the split sleeve on the upper projection. The sleeve is held safely by waterproof fabric bound with wire (as indicated by the loop). Only the cross-hatched section is explosive. It is doubtful if this would have worked in the trenches.

leave the grenade safe if it failed to detonate and yet not be so sensitive that it exploded prematurely in flight. Moreover, it should not explode if the bomber accidentally hit something with it or dropped it after it was armed and it should withstand rough handling. It should not be affected by water or mud and be cheap and easy to make in large numbers, as well as easy to assemble correctly but impossible to assemble incorrectly, and easy to inspect. The fact that the simpler the grenade was to manufacture the safer and more reliable it was likely to be was not lost on the designers. Moreover, the undesirability of streamers tied to a handle was well understood. The concept of what constituted a good grenade had come a long way in four years.

One of the Trench Warfare Department's first attempts at a percussion grenade was an improvement on the No. 1 and No. 2 patterns and resulted in the No. 19 but this was far from ideal as it was a stick grenade over 11 in long. In early 1916 GHQ complained that the handle had a poor grip and that the grenade was too sensitive, like the No. 1 Mk III. Nevertheless, it asked for a supply of 12,000 for troop trials. It was not an unqualified success. Although the

over the time-fused sort. Principal among these was the fact that a safe and reliable percussion grenade that could also be used as a rifle grenade would reduce the number of types of service grenade, in itself a good enough reason to keep up the search. The Munitions Inventions Department had been actively searching for a percussion grenade since the early days of the war. Whereas the Trench Warfare Department tended to deal with in-house ideas or ideas that had originated in the armies in France, the Munitions Inventions Department sifted ideas submitted to it from other sources, including the public.

A percussion grenade had to satisfy stringent criteria which were set out in a Munitions Inventions Department report in 1918 and in Brothers' 'Development of Weapons used in Trench Warfare'. A percussion grenade should be capable of clearing a shell hole or a trench bay (the Mills was too powerful while the egg grenade was not powerful enough; a 1 lb percussion grenade was deemed to be about right). It should be usable as a hand grenade that could be thrown at least 15 yd and capable of being fired from a discharger, without having to use adapters of any sort, to distances of 450 yd. The percussion fuse should detonate the grenade on any surface, hard or soft, and irrespective of the angle of impact but

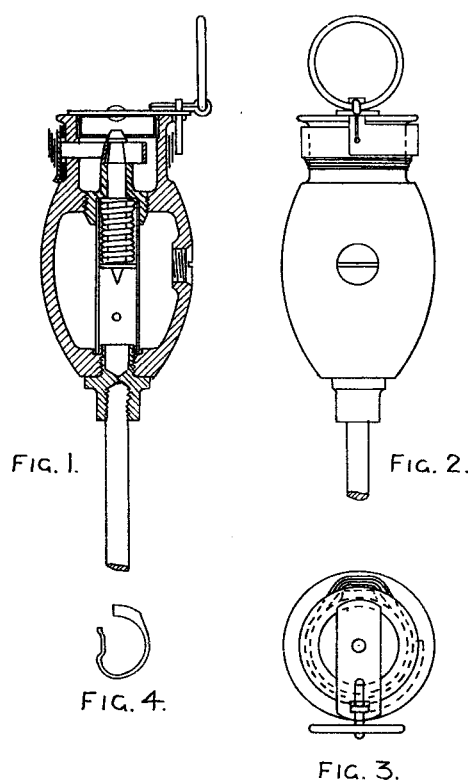


Billingham's patent safety percussion grenade with all-ways fuse operated by inertia of a weighted ball (UK patent 102,390).

fuse functioned well enough, it was hardly any more safe than the earlier percussion types and had to be handled with far more care than a Mills. In the meantime, a different line of approach led to the Woolwich Arsenal developing a percussion fuse adapted from that used on German trench mortar bombs. Its sensitivity had to be increased by using a new method of ignition. In addition, a new delay device acting as a safety mechanism was also devised. The new fuse was fitted to a Ball grenade and trials were conducted in March 1916.

While this was going on, the Trench Warfare Committee imposed additional requirements for percussion grenades and the modified Ball went back to the drawing board. In 1916, while the development of the percussion Ball continued, a number of other percussion grenades were brought to the attention of the Munitions Inventions Department and GHQ. Among these were the Charmier (for some reason spelt Chamier in the departmental reports) and DG grenades, both of which were patented inventions (125,436 and 124,837 respectively). Both appeared to be quite promising. However, tests with the Charmier were ultimately unsatisfactory and in 1917 work with it was discontinued, although SS 171/4, the fourth inventions newsletter, indicated that GHQ was expecting a supply of the Charmier for troop trials in March 1918. The discrepancy may be due to both the Trench Warfare Department and the Munitions Inventions Department undertaking trials of the Charmier independently of each other, although it may have more to do with the political pressure that was brought to bear over the DG grenade.

The DG grenade, also known as the DG Patent Safety Grenade, got its name from the initial letters of the surnames of its two inventors Leslie Daniels and Charles Gardiner who took the grenade to the Munitions Inventions Department in early February 1916. The company that made the grenade was Trench Warfare & Armaments Ltd which may well have been set up during the war to manufacture munitions, if not the DG specifically, because the two inventors were in the boat business; Daniels was an associate member of the Institute of Naval Architects while Gardiner was a master mariner. The department was sufficiently interested in it to want to undertake trials, provided some modifications were made. These were duly carried out and trials started. By June 1917 a total of 6,730 DG grenades had been



The DG grenade (UK patent 124,837). Fig. 4 shows the retaining catch, a stiff metal blade that goes round the head of the striker. The white bar on the left in fig. 1 is the safety pin. Fig. 3 is a plan view of the top of the grenade, illustrating the tape and the metal weight on its end (the dotted line on the lower right, extending east to south).

thrown without a single accident. However, the grenade had evidently gone through numerous modifications of various sorts because by December 1917 it had become the Mk VIII. By this time, rifle-launched trials had also been conducted and in December the Munitions Inventions Department reported that the trials, with a new ballistite blank cartridge to fire the grenade from a cup discharger, had also been successful, without any prematures in flight. However, it is evident that by May 1917 the Munitions Inventions Department had decided to drop the grenade as unsuitable.

Enter W. O'Malley. It is not clear who he was but it seems likely that he was a former colonel of the Indian Army. In a forceful letter dated 21 May 1917 written to Sir Worthington Evans, MP, the Parliamentary Secretary, Ministry of Munitions, he expressed his dissatisfaction with the handling of the trials and decisions taken and demanded that something be done to rectify the situation. Evidently, the letter to Evans was prompted by a lack of response to a similar letter written some months earlier to Dr Addison, head of the Trench Warfare Department. O'Malley complained that all he got for his trouble was 'one of those stereotyped replies which are so characteristic of Government Departments'. Dr Addison had told him that he was in no position to interfere with the decisions taken by the Design Department which had taken over responsibility for the development of the grenade.

O'Malley's account of the history of the DG grenade is no doubt accurate, if somewhat biased, as he was trying to bring pressure to bear and needed to get his facts right. After the initial modifications to the grenade following its first appraisal by the Munitions Inventions Department, Lord Ardee (who was a grenade expert), Captain Godwin Smith and Major Colley were more than happy with it and 'declared it "perfect"'. A year later and the grenade had still not been adopted, which O'Malley put down to political manoeuvring and gerrymandering. At much the same time, the Design Department became involved and General Bingham, its head, freely confessed that he knew nothing whatsoever about grenades and relied on what his 'expert' told him. This was a Captain Ley. According to O'Malley, Ley 'took out a patent, in May last year [1916], for a device in connection with the grenade and he evidently was determined to have a grenade of his own rather than that recommended by the M.I.D.'. This is a curious statement.

In the first place, no grenade patent was ever granted to a Ley in May or any other month in 1916, nor indeed at any time during the war. However, Daniel and Gardiner applied for a patent for their grenade on 3 May 1916 and this may have been the patent to which O'Malley alluded. A possible explanation is that Ley acted on behalf of Daniel and Gardiner to get their invention patented, in which case his name would not have appeared on the patent as he was not one of the inventors, although this does not explain why this should have upset O'Malley. Indeed, O'Malley was gunning for Ley. The grenade that was favoured by the Design Department over the DG was one called the Humphries (O'Malley called it the Humphrey) which had evolved from the percussion Ball experiments to meet the Trench Warfare Committee requirements. Since there is no Ley patent, the implication is that the Humphries was his design, except that someone called Humphries was more probably the designer.

Although there were similarities between all percussion grenades, which became more alike as they were developed to overcome problems and satisfy the changing requirements, the DG and the Humphries had quite different mechanisms. The DG had a striker in a central tube, at the bottom of which was the detonator. The striker was held above the detonator by a spring and a safety device that was designed to prevent the grenade from exploding if accidentally dropped but which would arm the grenade once it had left the thrower's hand. The top of the striker was narrowed (or grooved) so that it had a flanged head round which was a safety catch made of 'a stiff blade of metal'; one end was held between the flanged head and a central plug through which the striker projected by the pressure of the striker spring, while the other end was weighted. The idea was that an impact displaced the weighted end by inertia so that the catch came away from its retaining position and released the striker. A safety pin held the catch in place which in turn was held by a tape wound several times round the top of the grenade. The free end of the tape had a metal plate fixed to it and this was held against the grenade by the safety pin. Before throwing the grenade, the pin was removed and the act of throwing unwound the tape which freed the safety catch in flight, so that when the grenade hit the ground the safety catch was displaced and the striker hit the detonator and exploded the grenade.

The Humphries' mechanism used two pellets with curved ends which were kept apart by a spring. One carried the striker while the other carried the cap which was opposite the mouth of the detonator tube. The pellets were in a chamber of larger diameter than the pellets and its ends were also curved to accommodate the pellets. They were brought together by an impact, causing the cap to be fired. A pin was used to keep them apart and render the grenade safe. A tape was attached to the pin and wound round the top of the grenade and held by a cap that locked in place. Before throwing the grenade the cap was removed and the tape unwound in flight, releasing the pin and arming the grenade.

On the recommendation of Ley, who evidently had never thrown the DG, Bingham pronounced the DG grenade to be dangerous and wanted it dropped forthwith. On the other hand, the Munitions Inventions Department had by then thrown several thousand over a period of sixteen months. Indeed, although Bingham had turned down the DG, the Munitions Inventions Department was continuing to test the grenade, a situation which O'Malley described as an expensive 'farce' as it had spent £3,000 on trials. To muddy the waters further, O'Malley claimed that Bingham had told him that GHQ did not want a percussion grenade whereas Sir William Robertson, Chief of Imperial General Staff, had told O'Malley that it did.

While the Design Department remained unimpressed, the Trench Warfare Department was more than happy with it. Following trials at the Lyndhurst Bombing School in January 1917, a report by Dr Addison described the mechanism as 'perfect'. This was the complete opposite of what the Design Department claimed. There was even a report from independent experts, Messrs McAlpine, that showed that the DG was superior to the Humphries. O'Malley could not understand why Addison had capitulated so readily to Bingham when his opinion of the grenade seemed to be very high. He was firmly of the opinion that 'departmental etiquette is infinitely more important than providing the Army with the grenade they require'. He wanted Evans to look into 'this most important matter' so that he would 'set aside the prejudiced and stupid decision of the Designs Department' to adopt the Humphries instead of the DG, a course of action he believed was 'wrong and ill-advised'. He also wanted Evans to investigate why an order for 25,000 DG grenades to be sent to France had been cancelled because a fair trial at the Front would, he was convinced, settle the matter once and for all.

Whatever the outcome of O'Malley's lobbying, trials were conducted in France in 1918 with 1,000 modified Mk VIII DG grenades. However, for all his efforts the grenade never got beyond this stage. It had been under consideration and development since at least early 1916. Its great rival, the Humphries, had a similarly chequered history. It underwent trials in 1917 and was rejected because the percussion mechanism was unreliable, mainly due to an unacceptably high proportion of blanks, only to resurface again in 1918 when it emerged as one of the leading contenders in comparative trials with several other percussion grenades. However, the Humphries had undergone a number of modifications since its rejection in 1917, including development of a more sensitive fuse. These later trials were rather different from the early ones. As already mentioned, the criteria were tougher and the candidates had to perform well as both hand and rifle grenades because the idea now was to find a single, multi-purpose grenade.

One of the problems facing designers of percussion grenades was the uncertain requirements of the troops at the Front. They were imprecise and rather vague so that developments tended to elicit negative responses rather than constructive comments. Part of the trouble was the lack of will to replace the Mills. However, it became apparent to researchers that an all-ways fuse was needed to ensure that a percussion grenade would explode irrespective of the angle at which it struck the ground. In July 1918 an exhaustive set of trials of all types of percussion grenade was conducted. The contenders were subsequently reduced to four: the Bellamy, the Coles, the Vickery and the Humphries. It is not known what the first three were. Both the DG and the Charmier had failed to make the shortlist. When the war ended, no decision had been reached and the Army was still without a percussion grenade.